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(21) International Application Number: PCT/EP95/03886 (22) International Filing Date: 2 October 1995 (02.10.95) (30) Priority Data: 94307512.7 13 October 1994 (13.10.94) EP (34) Countries for which the regional or international application was filed: AT et al. (71) Applicant (for AU BB CA GB IE KE LK MN MW NZ SD SG SZ TT UG only): UNILEVER PLC [GB/GB]; Unilever House, Blackfriars, London EC4P 4BQ (GB). (71) Applicant (for all designated States except AU BB CA GB IE KE LK MN MW NZ SD SG SZ TT UG): UNILEVER N.V. [NL/NL]; Weena 455, NL-3013 AL Rotterdam (NL). (72) Inventors: BARRACLOUGH, Anthony, John; Riverside, Mill Road, Wellingborough, Northamptonshire NN8 1QW (GB). CLARK, Elsie, Mary; 9 Fairfax Road, Bedford MK40 4LS (GB). HART, Paul, Marcus; 154 Wymington Road, Rushden, Northamptonshire NN10 9LA (GB). THOMPSON, Eric, William; 320 Newton Road, Rushden, Northamptonshire NN10 0SY (GB).		(74) Agent: KIRSCH, Susan, Edith; Unilever plc, Patent Division, Colworth House, Sharnbrook, Bedford MK44 1LQ (GB). (81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TT, UA, UG, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG). Published <i>With international search report.</i>

(54) Title: PROCESS FOR THE PREPARATION OF A FOOD PRODUCT**(57) Abstract**

A process for the preparation of tomato-based products of high quality and consistency comprising: subjecting a tomato paste to a high pressure shear field; adding a source of pectin methylesterase; incubating such that a desired consistency is achieved; and inactivating the pectin methylesterase. The product obtained preferably has a pulpy texture and appearance.

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PROCESS FOR THE PREPARATION OF A FOOD PRODUCTField of the Invention

5 The invention relates to a process for the preparation of tomato-based products of high quality and consistency and products obtained by this process.

Background to the Invention

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It is desirable to be able to produce tomato-based products having a high consistency and quality with a low tomato solids content. In order to do this it is necessary to be able to substantially increase the viscosity of the tomato
15 paste used to prepare such products, for example tomato-based sauces.

US 3 892 877 (Wagner et al) and US 3 976 805 (Becker) disclose processes for preparing tomato products of high
20 consistency.

US 3 892 877 discloses a process comprising:

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(1) maceration of raw tomatoes followed by heating; (2) treating the hot macerate with acid; (3) separation of the juice; (4) neutralisation of the juice; (5) homogenisation of the juice using either a conventional blender or a homogeniser (commonly used in creameries) which operates by forcing the juice under high pressure through a small orifice.

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US 3 976 805 discloses a similar process except that a juice is first prepared by conventional techniques (ie. maceration and heating of raw tomatoes followed by extraction of juice from the macerate) and then an acid treatment, neutralisation and homogenisation is applied to the resulting juice.

Such processes have the disadvantage that the tomato is subjected to a chemical treatment, ie acidification, which will damage cellular proteins and reduce texture and/or taste quality. Also, both US 3 892 877 and US 3 976 805 teach that the desired increase in consistency cannot be attained by homogenisation alone: the acidification step is essential.

US-A-4556576 teaches subjecting concentrated tomato solids to the processing steps of (i) steam infusion, (ii) vacuum flask expansion, (iii) milling and (iv) high pressure homogenisation; the tomato products prepared by this process have increased consistency.

EP-A-0123345 relates to methods for minimising flavour loss and controlling the consistency of tomato products containing one or more members of the Allium botanical genus, when processed primarily at temperatures below those commonly used. Gel formation is regulated (ie. promoted or prevented) by: pre-treatment of the allium; or heating the tomato product to a specific temperature prior to allium addition; or depolymerising the tomato pectin prior to allium addition.

The present invention seeks to provide an improved process for manipulating the consistency and the texture of tomato-based products having a low solids content.

Disclosure of the Invention

According to the present invention, there is provided a tomato-based product comprising:

- (i) subjecting a tomato paste to a high pressure shear field;
- (ii) incubating the paste with a pectin methyl esterase source to achieve a desired consistency; and

(iii) inactivating the pectin methyl esterase.

Using this process, a tomato sauce having a pulpy texture/appearance and an excellent consistency may be obtained. In contrast, a tomato sauce produced by homogenisation alone has a smooth texture/appearance. Preferably, the tomato sauce formed should not gel during processing.

The high pressure shear field is provided by homogenisation in a homogeniser (commonly used in creameries) which operates by forcing juice under high pressure through a small orifice. Preferably the pressure is from 560 to 7000 psi. Most preferably from 560 to 2800 psi.

The consistency increase achieved by the present invention cannot be achieved if a conventional blender is used for the homogenisation process.

The tomato paste prior to homogenisation may be provided by the conventional hot-break process.

In the hot-break process, raw tomatoes are fed into a vessel provided with steam coils (or steam jackets) and a rotating blade assembly for comminuting the tomatoes and agitating the material in the vessel so that good heat transfer will be obtained. By use of such equipment the raw tomatoes are efficiently formed into a macerate. The seeds, skin, bits of cores and other debris are then removed before homogenisation. The hot-break process is typically conducted at a temperature of greater than 80°C, especially from 85 to 95°C.

A suitable source of pectin methylesterase may be any vegetable or fruit, such as green beans, snap beans, potatoes, cauliflowers, sour cherries, green tomatoes, green peppers, oranges, apples, bananas, pears, turnips,

onions, garlic and mixtures thereof. Immature fruit and vegetables are preferred. Particularly preferred sources of pectin methylesterase are those, such as green tomatoes, green peppers, green beans and snap beans, which produce a pulpy appearance, rather than a smooth gel appearance.

The pectin methylesterase source is added to the homogenised tomato paste, optionally with any other sauce ingredients. The mixture is then incubated to activate the enzyme and allow firming to occur. The incubation is typically conducted at 50°C for 30 minutes. Once the desired thickness has been achieved the temperature is raised so as to inactivate the enzyme. Typically the temperature is raised to 90°C for 10 minutes.

Addition of calcium ions in conjunction with enzyme activation leads to additive firming effects. Calcium ions are preferably added up to a level of 500 ppm. Most preferably calcium is added at a level of from 100 to 1000 ppm. The calcium ions may be added before or after the incubation period.

Alternatively or additionally magnesium, copper and/or ferric ions can be added. These ions should be added after both the incubation period and the rise in temperature to inactivate the enzyme has occurred.

It is known that the addition of NaCl solubilises enzymes which results in accelerated gelling. Thus, if NaCl is added prior to processing, this is a problem, since the product forms an undesirable gel. Hence, NaCl is preferably added after the inactivation of the enzymes (ie. PME).

A further advantage of preparing a thickened tomato paste in accordance with this invention which includes using a high pressure shear field, is that the final product not

only exhibits a high consistency but also the product is less subject to syneresis.

The tomato paste produced by this process can be sold as it is or can be used as the basic ingredient of products, such as sauces, ketchups, pizza toppings and soups.

Clearly any sauce product prepared may comprise a tomato content that is totally or only partly provided as a thick tomato paste made according to the invention.

Examples

Example 1

Tomato paste of 30 Brix was diluted to 12 Brix. This was then passed through a Crepaco dairy homogeniser twice at a pressure of 2000 psi.

The resulting paste was substantially thickened.

The thickened paste was diluted to 8 Brix and heated to 50°C. Oil, calcium chloride and green tomato puree (pectin methylesterase source) were added to achieve the following final composition.

Sauce Composition

Homogenised tomato paste 8 Brix.	92.5%
Green tomato puree	6.3%
NaCl	0.85%
Soyabean oil	1.1%
CaCl ₂ .2H ₂ O	0.05%

The mixture was incubated for 30 minutes at 50°C before raising the temperature to 90°C for 10 minutes. NaCl was added and the sauce was then cooled to room temperature.

The sauce had an excellent consistency and a pulpy appearance.

Example 2

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A tomato paste was diluted to 12 Brix; it had a Bostwick value of 8.2.

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A first portion of this original paste was passed through a Crepaco dairy homogeniser at a pressure of 2000 psi; the resulting tomato paste had a Bostwick value of 5.4.

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To a second portion of the original paste, a pectin methyl esterase source was added in accordance with example 1; the resulting tomato paste had a Bostwick value of 2.8.

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A third portion of the original paste was passed through a Crepaco dairy homogeniser at a pressure of 2000 psi; a pectin methyl esterase source was then added in accordance with example 1; the resulting tomato paste had a Bostwick value of 0.5.

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The Bostwick values were obtained as follows. A 100 ml sample at 25°C was placed into the Bostwick consistometer and the distance flowed (cm) was measured. The higher the distance flowed, the lower the consistency or viscosity.

CLAIMS

1. A process of providing a tomato-based product comprising:

(i) subjecting a tomato paste to a high pressure shear field;

(ii) incubating the paste with a pectin methyl esterase source to achieve a desired consistency; and

(iii) inactivating the pectin methyl esterase.

2. A process according to claim 1, wherein the tomato-based product has a pulpy texture.

3. A process according to claim 1 or claim 2, wherein the tomato paste prior to homogenisation is provided by a hot-break or cold-break process.

4. A process according to any preceding claim, wherein the pressure applied is from 560 to 7000 psi.

5. A process according to any preceding claim, wherein the pressure applied is from 560 to 2800 psi.

6. A process according to any preceding claim, wherein the pectin methylesterase source is a vegetable, fruit or mixture thereof.

7. A process according to claim 6, wherein the pectin methylesterase source is selected from the group consisting of green beans, snap beans, potatoes, cauliflowers, sour cherries, green tomatoes, green peppers, oranges, apples, bananas, pears, turnips, onions, garlic and mixtures thereof.

8. A process according to claim 5, 6 or 7 wherein up to 400 ppm of a calcium ion is added either before or after incubation.

9. A tomato sauce product obtainable by

(i) subjecting a tomato paste to a high pressure shear field;

5 (ii) adding a source of pectin methylesterase

(iii) incubating such that a desired consistency is achieved; and

(iv) inactivating the pectin methylesterase.

10 10. A tomato sauce product as claimed in claim 9, wherein the pressure applied is from 560 to 2800 psi.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A23L1/212 A23L1/06 A23L1/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 556 576 (D.P.GAEHRING) 3 December 1985 cited in the application see claims 1,6,10,15,16 see column 3, line 7-42 see column 6, line 12-23 see column 6, line 61-66 ---	1-10
A	EP,A,0 123 345 (PROCTER & GAMBLE) 31 October 1984 cited in the application see claims 1,2,10-15 see page 8, line 29 - page 9, line 36 ---	1-10
A	WO,A,94 12055 (GIST-BROCADES) 9 June 1994 see claims --- -/--	1,9

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

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Date of the actual completion of the international search

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,3 892 877 (J.R.WAGNER ET AL) 1 July 1975 cited in the application see the whole document -----	1,9
A	US,A,3 976 805 (R.BECKER) 24 August 1976 cited in the application see the whole document -----	1,9

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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